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Innovation and Training in New Firms

by John R. Baldwin

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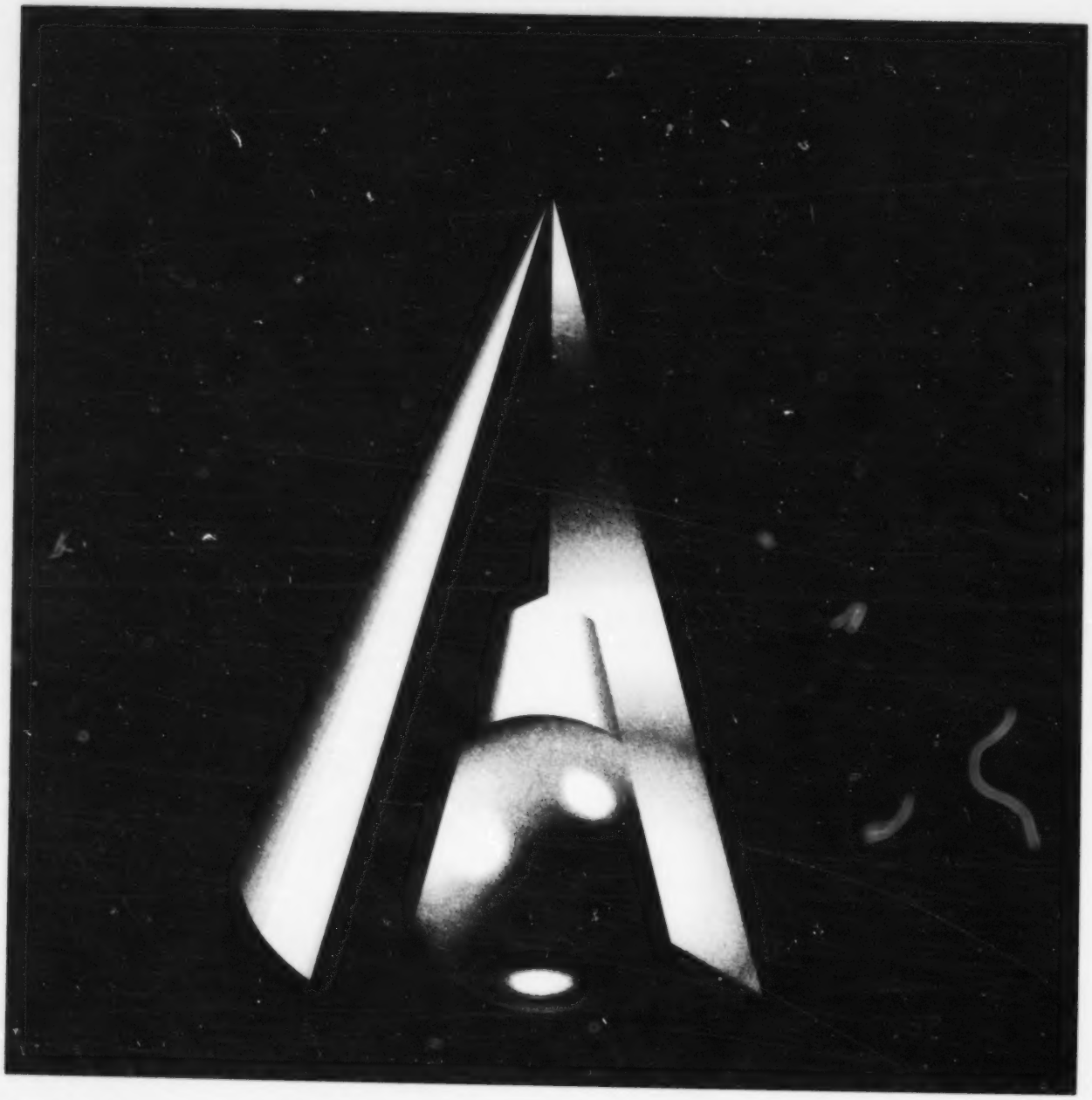

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Abstract

Recent studies have demonstrated the quantitative importance of entry, exit, growth and decline in the industrial population. It is this turnover that rewards innovative activity and contributes to productivity growth.

While the size of the entry population is impressive—especially when cumulated over time—the importance of entry is ultimately due to its impact on innovation in the economy. Experimentation is important in a dynamic, market-based economy. A key part of the experimentation comes from entrants. New entrepreneurs constantly offer consumers new products—both in terms of the basic good and the level of service that accompanies it.

This experimentation is associated with significant costs since many entrants fail. Young firms are most at risk of failure; data drawn from a longitudinal file of Canadian entrants in both the goods and service sectors show that over half the new firms that fail do so in the first two years of life. Life is short for the majority of entrants. Only 1 in 5 new firms survive to their tenth birthday.

Since so many entrants fall by the wayside, it is of inherent interest to understand the conditions that are associated with success, the conditions that allow the potential in new entrepreneurs to come to fruition. The success of an entrant is due to its choosing the correct combination of strategies and activities. To understand how these capabilities contribute to growth, it is necessary to study how the performance of entrants relates to differences in strategies and pursued activities.

This paper describes the environment and the characteristics of entrants that manage to survive and grow. In doing so, it focuses on two issues. The first is the innovativeness of entrants and the extent to which their growth depends on their innovativeness. The second is to outline how the stress on worker skills, which is partially related to training, complements innovation and contributes to growth.

Keywords: innovation, training

Acknowledgements

I am indebted to Joanne Johnson who assisted me with the entry survey that formed the basis of the data used in this paper and to Daniel Stripinis and Bob Gibson who assisted with the tabulations used herein.

1. *Introduction*

Recent studies have demonstrated the quantitative importance of entry, exit, growth and decline in the industrial population.[1] It is this turnover that rewards innovative activity and contributes to productivity growth.

The importance of entry can be gauged in the first instance by its size. The annual entry rates for the manufacturing sector (defined as the employment in entrants divided by total employment) from 1972 to 1986 averaged about 1.9% for the United States and 2.4% for Canada (Baldwin, Dunne, and Haltiwanger, 1995, p. 127). When calculated over five-year periods (1972-77, and 1977-82), the US average across two-digit industries was 11.3%, while the Canadian was 10.9% (Baldwin, Dunne, and Haltiwanger, 1995, p. 137).

These rates need to be set in context. Entry is not the only process that causes turnover in the firm population. Growth and decline also occur in the incumbent population. The amount of market share transferred from all declining to all growing firms (including both exits and entry) in a typical Canadian manufacturing industry over a decade ranges between 30% and 40% (Baldwin, 1995).

A significant part of this turnover comes from the entry and exit of firms. At any point in time, the population can be divided into those that grow and those that decline. Job turnover is the sum of all employment increases in those growing (job growth) and the sum of the change in employment in those declining (job loss). The importance of entry and exit can be calculated as the share of job growth that is accounted for by entry, or the share of job decline that is accounted for by exit. When this is done using comparable manufacturing databases for Canada and the United States, the results are quite similar. For year to year changes from 1970 to 1985, job creation due to entry in the United States averaged 21% of the total job increase; in Canada, it averaged 27%; (Baldwin, Dunne and Haltiwanger, 1995, p. 126). Calculated over two comparable five-year periods (1972-77, 1977-82), entry accounted for 44% in the United States and 45% in Canada. As the length of period over which the importance of entry is calculated, entry becomes relatively more important.

While the size of the entry population is impressive—especially when cumulated over time—the importance of entry is ultimately due to its impact on innovation in the economy. Experimentation is important in a dynamic, market-based economy. A key part of the experimentation comes from entrants. New entrepreneurs constantly offer consumers new products—both in terms of the basic good and the level of service that accompanies it.

By doing so, new firms provide an important stimulus to the industrial population. A few small entrants grow to become the new dynamos of the industrial system. Others remain relatively small but provide an important source of innovation in the small-firm sector—especially when it comes to quality differentiation. Smaller firms excel in their ability to provide quality and

[1] See Baldwin (1995).

flexibility of service (Baldwin et al., 1994). Small firms are constantly changing their product offerings—with respect to both types of products and services offered. Small firms are adept at ascertaining changing consumer tastes with regards to the amount of services that are bundled with a product, or being flexible with regards to other aspects of the product offering. New small firms that are better able to sense consumer requirements are constantly replacing other small firms that are less able to do so (Baldwin, 1995). One manifestation of the success of small entrants is their tendency to pay higher wages and to be more productive than those firms that they force out of the market (Baldwin, 1995; 1996). It is the process of entry and exit that generates information on which combinations of products and services best satisfy consumer tastes.

This experimentation is associated with significant costs since many entrants fail. Young firms are most at risk of failure; data drawn from a longitudinal file of Canadian entrants in both the goods and service sectors show that over half the new firms that fail do so in the first two years of life.[2] Life is short for the majority of entrants. Only 1 in 5 new firms survive to their tenth birthday.[3]

These failures involve a cost—both in human and financial terms. Failure is accompanied by the expenditure of both dollars and time on the part of new entrepreneurs. This is the investment that the market economy makes while experimenting in finding the new and improved goods and services that consumers want. It can also be regarded as an investment in managerial experience, because some entrepreneurs who fail will learn from their experiences and go on to found other new businesses that eventually succeed. These resources should not be regarded as wasted—anymore than the resources that are expended on obtaining information in a world of imperfect information are wasted. Failures are an investment that society makes in the dynamic competitive process.

Since so many entrants fall by the wayside, it is of inherent interest to understand the conditions that are associated with success, the conditions that allow the potential in new entrepreneurs to come to fruition. The success of an entrant is due to its choosing the correct combination of strategies and activities. To understand how these capabilities contribute to growth, it is necessary to study how the performance of entrants relates to differences in strategies and pursued activities.

The objective of this paper is to describe the environment and the characteristics of entrants that manage to survive and grow.[4] In doing so, it focuses on two issues. The first is the innovativeness of entrants and the extent to which their growth depends on their innovativeness. The second is to outline how the stress on worker skills, which is partially related to training, complements innovation and contributes to growth.

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[2] See Baldwin and Johnson (1999).

[3] See Baldwin, Bian, Dupuy and Gellatly (2000).

[4] See Baldwin, T. Gray et al. (1997) for a study of the characteristics of new firms that are associated with exit.

2. *The Survey of Entrants*

The development of longitudinal databases on exit and entry have allowed us to better estimate the amount of entry taking place and to determine that this aspect of turnover shifts significant amounts of market share and changes the identity of market participants. But the longitudinal databases derived from administrative records do not contain very rich descriptions of the participants. Survey data has to be developed if we are to better understand the underlying characteristics of entrants—their competencies not only with regard to innovation but also in such areas as human resource development, marketing, and management; their financial structure, their training activities and how this relates to innovation. When survey data are developed and linked to longitudinal data on firm performance, such as sales or profitability, differences in competencies that are related to performance differences can be outlined. Here we use a survey of entrants to outline the type of environment that entrants face and the connection between growth, innovation and associated competencies that innovative firms develop.

We make use of firm-level data on entrants to examine the nature of their innovative capabilities. The firm-level data are taken from *The Survey of Operating and Financing Practices* of entrants performed by Statistics Canada. The focus on new firms permits us to examine the innovative capabilities of entrants as opposed to small firms in general. The richness of the survey database allows both output and input-based measures of innovation, technological and skill-based competencies of smaller firms to be developed.

The survey focused on new entrants that emerged from their early childhood and survived to their early teen years. In light of the high death rate of new firms, these are the more successful entrants. The frame consisted of all entrants to the commercial sector (both goods and services) in the period 1983-86 that survived to 1993; the survey was conducted in 1996. The sample included 3,991 firms from both the goods and services sector. The response rate to the survey was 80%.

The survey provides a broad overview of the financing and operating practices of entrants. The questionnaire contains information on 1) management—the extent of managerial and industry experience and the degree of ownership in the firm 2) the nature of the competitive environment—whether products quickly become obsolete, whether production technology changes rapidly, whether the threat of new entry is high 3) the firm's competencies in the area of management, technology, human resources, financing, marketing and production, with special attention paid to various facets of competencies in each area 4) the extent of financial planning 5) the importance of investment in R&D, technology, and training 6) whether the firm engaged in formal training and 7) the manner by which various activities were financed.

While the entrant survey offers a wide and varied set of questions that can be used to gauge the technological prowess of entrants, there are potential problems that should be addressed. First, many of the questions are subjective. The potential problems with subjective questions are well known. The most important is that subjective questions dealing with subjects that are inherently difficult to evaluate or out of the range of a respondent's experience provide information that is

unreliable. The classic example is a question that asks subjects to rank various shades of blue by their 'blueness' or asks someone to rank their abilities to perform a task with which they are unfamiliar.

Although many of the questions of this survey are subjective, they fall within the range of experience of the managers of new firms. The questions that deal with the magnitude of competitive forces and importance of competencies in various areas are all questions that business managers ask themselves on an ongoing basis. Competitive forces require firms to compare themselves against their competitors. The practice of benchmarking, for instance, has led many firms to assess themselves against industry leaders on a continuous basis.

In order to minimize ambiguity, the questions in the survey were all tested extensively with survey managers. Some questions were taken from previous surveys. The survey also addressed the subjectivity problem by including objective measures of activity in areas where it was feasible. The inclusion of parallel questions on activity provides an independent check on the validity of the answers to the subjective questions. Answers to the question about the emphasis given to R&D can be compared to answers regarding the percentage of investment devoted to R&D. Answers to the question about the emphasis given to training can be compared to answers regarding whether training is done. When these comparisons are made, the subjective valuation given by a firm to an activity and the probability that an action is undertaken are found to be closely related.

Another potential problem arises in business surveys when respondents taken from different areas in a company have different views of the importance being given to different strategies. This is a particular problem when the views being solicited deal with prescriptive issues—what should be done (as opposed to a recollection of actual events), or what emphasis has been given in the past to these issues. Since *The Survey of Operating and Financial Practices of Entrants* focuses on the latter set of questions, the potential for this problem with the data is lessened. There is a second reason for arguing that this is a relatively unimportant problem with the survey. Although information loss in a large company may result in some senior personnel not fully appreciating the directions that the firm is taking, the survey being used here focuses on smaller firms, where all senior personnel are close to ongoing events. Since the survey was usually filled in by senior management, variability of responses across individuals is likely to be less of a problem.

Finally, there are other issues related to the nature of measurement that derives from an ordinal Likert scale. The measurement issue is handled here by using the extreme score measure (the percentage of firms scoring 4 and 5 on the five-point scale) to capture all firms that assessed themselves as higher than the median category. This gives a robust measure of the percentage of firms that felt they were above the midpoint of the distribution of scores that was given to them—but does not worry about distinctions above this point.

The survey data, by itself, provides a profile of the broad strategies of entrants—the marketing and production strategies that they pursue, the innovations that they introduce and the training activities of the firm. It is linked to administrative data on sales, assets, and the wage bill of each

firm since birth. In doing so, we develop objective measures of performance by which the sample can be divided so as to investigate the strategies that are associated with success. For the purpose of this paper, performance is measured in terms of growth of output. The growth rate is measured as the compound rate of growth in sales from the first year after birth to 1993.

3. A Profile of Entrants

This section of the paper begins the process of describing the strategies that the select group of entrants who survive to their early teen years pursue. It will outline the product, marketing, and production strategies that are given the most emphasis. In later sections, we turn to the emphasis that is placed on worker skills, the importance of innovation and technology and finally how both affect the growth prospects of entrants. But first we describe the competitive environment that conditions the activities that entrants pursue.

3.1 The Competitive Environment

The competitive environment that new entrants face affects the skills required for survival and growth. Competition has many dimensions: it depends on the type of rivals an entrant faces, the pressures placed upon it by buyers and suppliers, and the rapidity of changes in products and technology.

The type of competition in an industry is partially determined by the maturity of the market. Industries vary by the stage of development of the market for their primary product. The introductory stage consists of those markets where the product demand is just starting to grow, but the product is unknown to many potential users; the growth stage occurs when product demand is growing and the product is becoming familiar to many potential users; the maturity stage is when product demand growth is slowing and the product is familiar to most potential users; finally post-maturity occurs when no growth in product demand occurs and there are few potential new users. The stage of the product is expected to influence the firm because previous work (Gort and Klepper, 1982) suggests that early stages in the product lifecycle involve a high degree of uncertainty. Product and technological innovations follow one another in quick succession. In later phases, the types of problems that a firm faces change. Reducing production costs via technological change becomes more important.

Despite the fact that successful entrants are new, they generally serve mature markets. While 29% of successful entrants are in a growing product market, 50% are in mature markets. Moreover, a greater percentage is in the post-maturity phase (18%) than the introductory phase (3%). As the lifecycle model would have predicted, successful entrants as a whole reported more rapid technological than product obsolescence. When asked to indicate if they felt that products quickly become obsolete and production technology changes rapidly in their industry, only 24%

of entrants felt that product obsolescence was rapid in their industry[5] (Figure 1). Yet, 45% said production technology changed rapidly.

The number of competitors also serves as a measure of the amount of competition that entrants face. About 40% face between 5 and 19 competitors. Another 38% compete with over 20 firms. However, the number of competitors is only a rough proxy for competitiveness; firms face competition from potential as well as existing competitors. Even when the number of competitors is small, rivalry can be intense.[6] In order to gauge the intensity of competition, entrants were asked if they disagreed or agreed with two propositions 1) that the threat of entry was high, and 2) that their competitors' actions were predictable. Most entrants (41%) felt their competitors' actions were easy to predict. However, some 61% of entrants felt that threats from entry were high (Figure 1).

Customer relations also affect the nature of the competitive environment. Firms with only one customer face uncertainty due to bilateral bargaining and the loss of the customer. Firms with few repeat customers cannot build customer loyalty. Neither factor is very important for successful entrants. Over half obtain less than 10% of their revenue from one customer and over two-thirds of their customers are repeat customers.

Uncertainty also arises when consumer demand is difficult to predict and/or consumers can easily substitute among competing products. The ease of substitutability represents the largest source of uncertainty for entrants, as almost 60% of these firms felt consumers could easily substitute competing products (Figure 1)[7]. Unpredictability of consumer demand was less of a problem; just 40% of successful entrants rated this hard to predict.[8]

The competitive environment that successful entrants face is also affected by the nature of product competition. Entrants ranked competition in their industry on a scale of 1 (low) to 5 (high) in seven areas—price, customer service, quality, and flexibility in responding to customers, product range, product customization, and the frequency of introducing new/improved products. The percentage of successful entrants that ranked each area as highly competitive (4 or 5) is plotted in Figure 2. In keeping with their occupying mainly mature markets, successful entrants report that competition in their industry is greatest with respect to price, customer service and quality. In contrast, factors that mark growth industries—customization or introducing new products—are less important.

[5] That is, they scored 3, 4 or 5 on a scale of 1 to 5.
[6] See Baldwin (1995) for data that show that the intensity of competition, as measured by market share turnover, is not closely related to concentration.
[7] That is, they ranked this possibility with a 3, 4 or 5.
[8] *Ibid.*

Figure 1. Entrants' Perceptions About Their Industry Environment

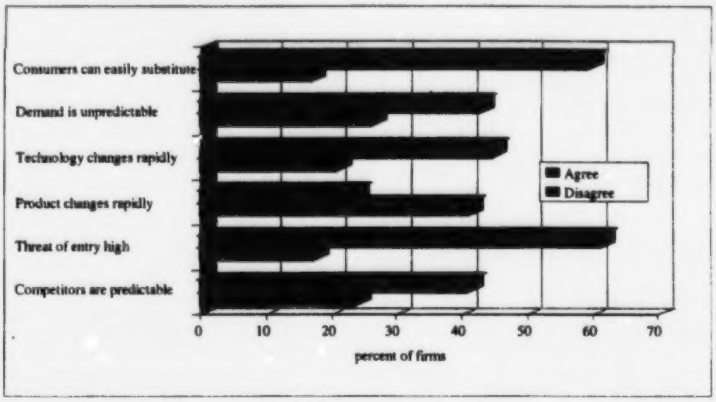


Figure 2. Percentage of Entrants Reporting Intense Industry Competition

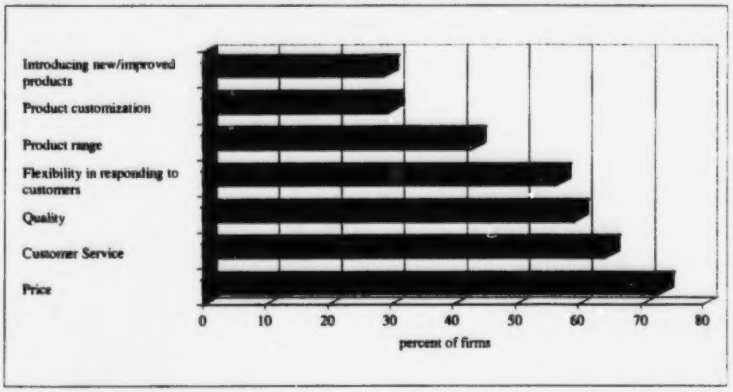
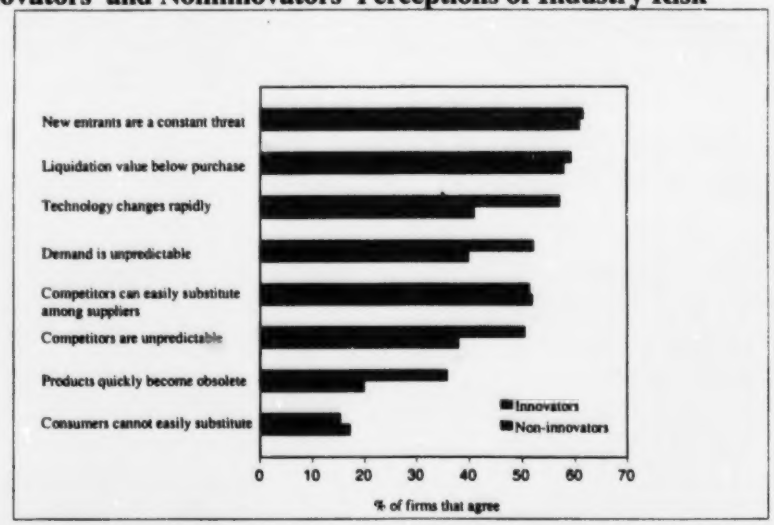


Figure 3. Innovators' and Noninnovators' Perceptions of Industry Risk



Do innovators face a quieter environment than non-innovators? Is innovation in the small-firm segment encouraged by concentrated market structures? The lifecycle model of entry offered by Abernathy and Utterbach (1978) or by Gort and Klepper (1982) would suggest that innovative entrants generally should be found in highly fluid, highly competitive situations.

In order to examine this issue, entrants are defined to be innovative if they are introducing new products or processes; then differences between entrants that are introducing new products and processes and those that are not doing so are examined.

How does the competitive environment of innovators differ from non-innovators? First, innovating successful entrants face more competitors; only three-quarters of non-innovative entrants face more than four competitors, compared to 87% of innovators.

Second, innovators are generally found in segments of industries where certain key aspects of competition focus on innovation. When the perceptions of innovators and non-innovators about the nature of competition that they face are compared (Figure 3), it is clear that changes that are related to innovation are far more intense in the innovators' industries. Technology is more likely to be changing rapidly. Products are more likely to face rapid obsolescence. Demand is unpredictable, probably because competitor actions are also more difficult to forecast.

It should be pointed out that, in other environmental areas, competition is just as intense for both innovators and non-innovators alike. The threat of entry is high everywhere. Firms are just as capable of switching suppliers. Both groups face the same threat that consumers can easily substitute products if they should so choose.

While small firms may have to find a niche strategy in order to survive, the innovators among them do not lead a protected existence. In general, all entrants continuously face the threat of entry. Innovators are also faced with continuous changes as a result of new product introduction and technological change that are related to the innovative nature of their industry.

3.2 The Focus of Entrants

What are the product and production strategies adopted by new firms in the face of the environment that they face? A firm's product-based strategies are directed at making their existing products as attractive as possible to consumers. There are several ways in which firms can do this: they can offer an attractive price, focus on quality, and strive to provide superior customer service, or offer flexibility in meeting their customers' needs. Alternatively, firms can try to alter their product line. In doing so, they might choose to customize their products, develop a product line that carries a wide range of related products, or continually expand and update their product line by frequently introducing new/improved products.

Of these strategies, successful entrants give the highest priority (scored on a scale of 1 to 5) to strategies related to quality and service. Each of the strategies here—quality, customer service, and flexibility in responding to customers and price—are deemed to be important (Figure 4).

Figure 4. Importance of Product-Based Strategies

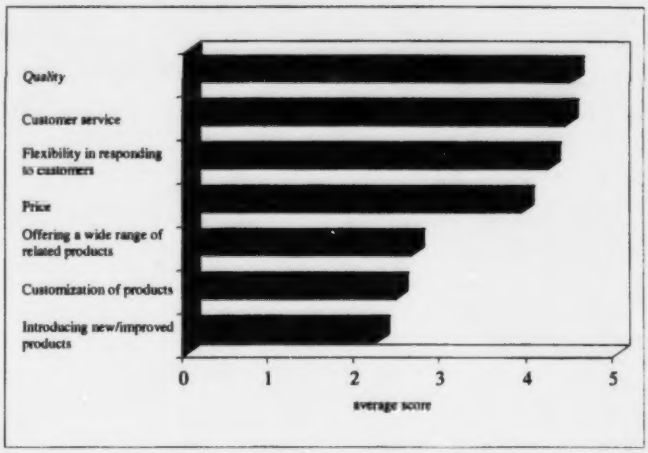


Figure 5. Importance of Market-Based Strategies

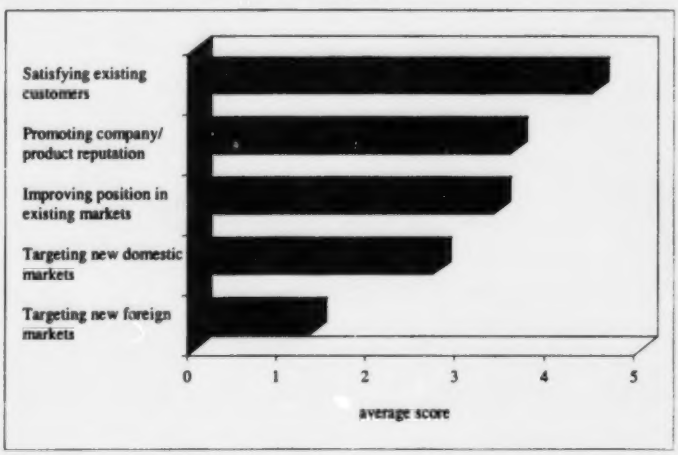
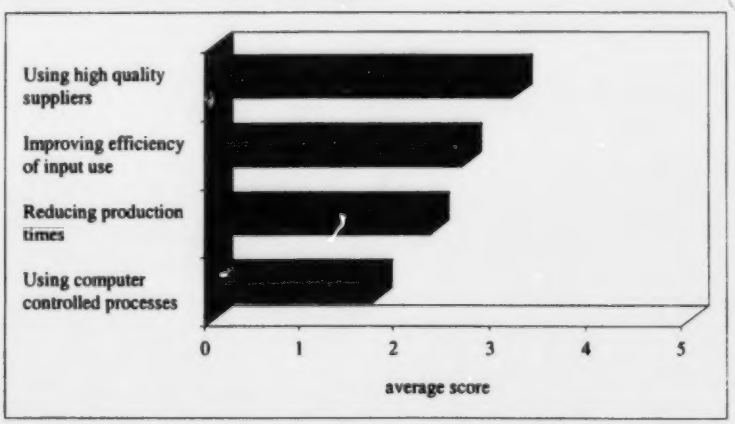


Figure 6. Importance of Production Strategies



Alternate strategies that involve updating, expanding or enhancing their product line are perceived to be less important by successful entrants.

The quality-oriented niche strategies are aimed at maintaining existing rather than attracting new customers. Successful entrants concentrate their marketing strategies on their existing market. This broad strategy includes specific strategies such as: "satisfying its existing customers", or slightly more aggressive strategies directed at "promoting the reputation of the company and its products" and "improving position in existing markets". Successful entrants, on average, place less value on capturing new markets, be they domestic or foreign (Figure 5).

The third component examined here is the production strategy of entrants. They may seek to improve their production by doing it better, doing it faster, doing it more efficiently, or using better inputs. To do so, they may aim to reduce their use of material inputs; they may strive to reduce their production times; they may focus on the functioning of their production processes by introducing integrated computer controlled processes; or they may stress the importance of using high quality suppliers.

Corresponding to the high score that successful entrants give to quality as part of their product strategy, "using high quality suppliers" is rated the most important production strategy (Figure 6). Improving efficiency of input use is next in importance, followed by reducing production times and using computer controlled processes.

This picture of emerging successful entrants confirms the finding of other studies on small firms (Baldwin, et al. 1994, and D'Amboise, 1991). The success of small firms depends on their ability to produce a high quality output; their comparative advantage is the flexibility that allows them to provide quick and efficient service. Successful entrants develop a customer-oriented business focus. Their product strategies are aimed at enhancing the attractiveness of their current products in their existing market: they focus on quality and responsiveness to customer needs; and their process strategies are concentrated on improving the efficiency and quality of the production process.

4. *Entrants and Human Resource Strategies*

Managers of surviving entrants consider human resources to be critical to their success. Firms' product, marketing and production strategies are more likely to be implemented successfully by a workforce that is skilled and committed. Firms have to worry about obtaining the right quality of workers. They have to make choices between hiring skilled workers, investing in their training once they have been hired, and providing the correct motivation that will bring out the best in the workforce.

A human resource strategy for new firms then involves three steps—finding skilled workers, developing and nurturing the skills of their workers and keeping the best workers. Managers of new firms rated each of these on a score of 0—no importance or not applicable—to 5—high importance. The percent who felt strongly (a score of 4 or 5) that their ongoing success was the result of their emphasis on recruiting skilled employees or training their existing employees was about 55% (Figure 7). Some 32% stressed the importance of incentive compensation plans to their ongoing success.

Data on training activities confirm the subjective emphasis that the firms give to their human resource strategy. Just over half (52%) of successful entrants provided formal on- or off-the-job training to some of their employees. Moreover some 32% reported investment expenditures for training.[9] Money spent on training accounted for an average of 22% of investment expenditures across respondents who trained and also reported investment expenditures.

The value that a firm places on the importance of training is strongly related to the actual undertaking of training. The higher the importance that a firm attributes to training, the more likely it is to train (Figure 8).

[9] Investment figures usually underestimate the extent to which small firms engage in training since firms report having great difficulty in calculating their training expenditures. The firm typically has a record of its other investment expenditures, as it would receive an invoice for any such expenditure. The problem with training expenditures essentially lies in the fact that firms do not always know what to include in the estimates or they do not separate out such expenses.

Figure 7. The Importance of Human Resource Strategies

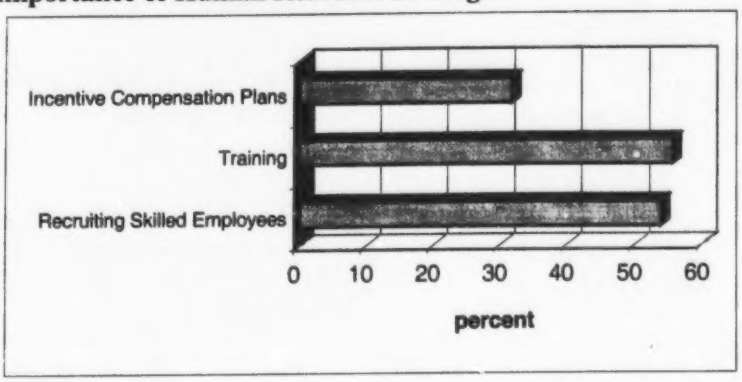


Figure 8. Percentage of Firms Training versus Score Attached to the Importance of Training

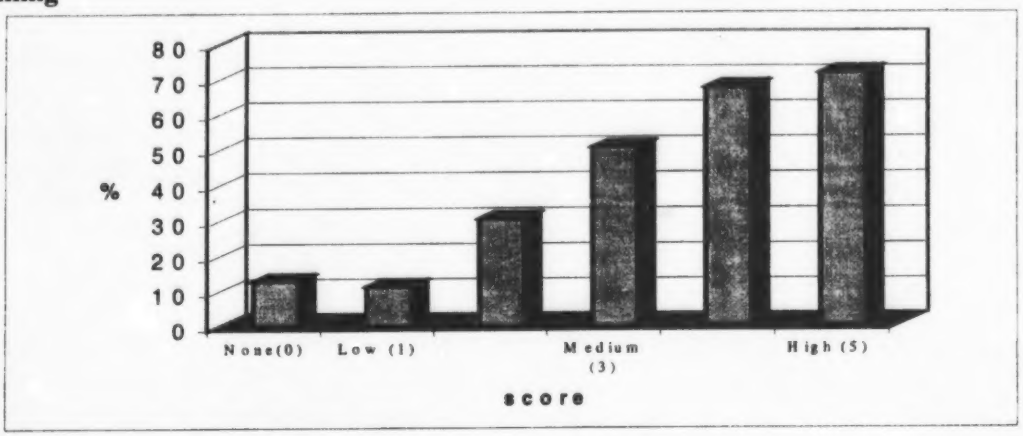
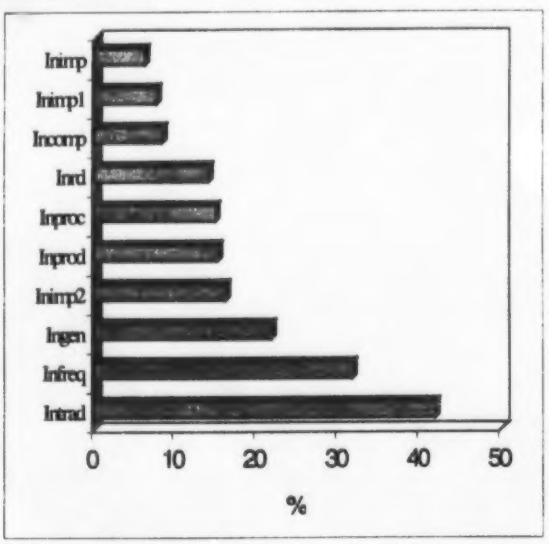


Figure 9. Measures of Innovativeness



5. *Innovation and Entrants*

The sheer size of the amount of entry and exit that is taking place is a testament to its importance. Competition is intense when the identity of the players change. Despite this, it is important to have supportive evidence of a concrete effect of entry on the performance of an industry.

Entrants are often seen as providing the dynamic new force in an industry that leads to change. Productivity growth is one way in which this is manifested. Geroski (1991) relates technical progress, efficiency and productivity growth at the industry level in the U.K. to entry rates and finds that roughly 30% of productivity growth is related to entry. Entry is seen to have a significant impact on productivity growth in the Canadian manufacturing sector when micro plant level data are used (Baldwin, 1995, p. 234). Somewhere between 20% and 25% of productivity growth in a manufacturing industry in the 1970s came from entry and exit. Haltiwanger (1998) reports the U.S share as 18%, using a similar micro-economic database.

Changes in productivity are the result of either product or process innovation. While there are few studies of the effect of new firms on productivity growth, much more attention has been paid to the effect of small firms on innovation. Audretsch (1995), for example, uses data from the SBA innovation database to argue that the US small-firm sector is more innovative than the large-firm sector. Audretsch defines efficiency as the number of innovations in small firms divided by the number of employees in small firms and reports that in 14 of 18 industries, this measure was larger for small than large firms.

The empirical work on small-firm innovation capability has had to wrestle with a paucity of usable data on innovations. Exercises to measure innovations using experts or trade journals have provided data on innovative tendencies; however, in doing so, they have tended to reduce the world of innovation to a single dimension.

Innovations are not easily pigeonholed in one compartment. Some innovations involve new products; others consist of new processes. Some firms will focus on the use of advanced technologies. Others will incorporate new ideas by embodying skills in their employees who will, in turn, devise and design new products. Technology and skills will be combined in different proportions across firms.

The variety of innovations that are being continuously introduced means that there is no single measure of innovativeness that innovation surveys or trade-journal searches should be expected to yield. It is not sufficient to argue that this could be resolved by specifying that it is only major innovations that should be included in the definition of an innovation since it is only major breakthroughs that should interest us. First, this still leaves the problem of defining 'major'. Second, this position ignores the important contribution that marginal innovations make. Hollander (1965), for example, studied the course of productivity growth in Dupont's rayon division and found that much of its productivity growth arose from marginal innovations. Freeman (1982) notes that substantial progress is made in the way of incremental process innovation and these types of improvements tend not to be captured in major event studies that focus on 'innovations'. Incremental innovations are not measured by patent statistics since they

are not patented, or by historical studies that focus on major breakthroughs.

If we are to understand the importance of new firms in the innovation process, it is essential to move beyond the very simple, partial analysis based on a single definition of innovation and develop a classification scheme based on a number of innovative competencies. Only by doing so can we fully appreciate the complexity of an innovation process that is multidimensional rather than unidimensional.

In order to study the innovative capability of successful entrants, we make use of questions on the innovative capabilities of firms and on their technological capacities. Each of these will be used to define the extent to which new firms followed an innovation or an advanced high-tech input strategy.

There are two types of questions that are used to provide information on the competencies of entrants. First, there are questions that characterize an entrant as following certain strategies—as producing a product innovation, as having formal training, or the percentage of investment in R&D or in training. These take on 0-1 values or are expressed as percentages. Second, there are answers to questions about the emphasis that entrants placed on factors such as R&D capabilities that contributed to the ongoing success of the firm. These questions were scored on a five-point Likert scale of 1(low importance) to 5(high importance). These are used here to gauge the entrant's competencies.[10] In what follows, entrants are deemed to possess a particular competency or to be stressing a particular strategy if they score that strategy as 4 or 5 on the five-point Likert scale.

5.1 Innovative Competencies

In order to capture the diversity of the innovative activity in entrants, the stress that new, small firms place on innovation is measured with 10 different variables. Each captures a different, though related concept of innovation.

Several of the measures make use of a question that asked whether an entrant had introduced an innovation. An innovation was defined as the introduction of a new or improved product or process, but not the introduction of aesthetic changes that did not affect the technical construction or performance of the product. These innovations were, in turn, characterized as being either entirely new products, modifications of existing products, entirely new processes, or modifications of existing processes. Finally, entrants indicated whether these innovations were protected with intellectual property rights. Combinations of these measures are then used to define whether the entrants were introducing innovations of varying degrees of novelty and importance.

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[10] Where possible the two sets of questions were cross-tabulated in order to validate the nature of the Likert scale. For example, there is a high correlation between the importance given to R&D and the % of investment devoted to R&D—or the score given to training and whether a firm had implemented a formal training program (See Baldwin and Gellatly, 1999). This has also been found in previous surveys that ask firms to score their competencies and to indicate the intensity of their activities (Baldwin et al., 1994).

These variables are:

INGEN–whether an entrant reports any innovation.

INIMP1–whether an entrant reports an innovation and it is protected by an intellectual property right such as a patent or the firm reports that a strategy of protecting its innovations with intellectual property is important or very important (a score of 4 or 5). Baldwin (1997) finds that the most novel innovations are those availing themselves of intellectual property protection.

INIMP2–whether an entrant reports an innovation that is either a completely new product or a completely new process.

INPROD–whether an entrant is a product innovator.

INPROC–whether an entrant is a process innovator.

INCOMP–whether an entrant is both a product and a process innovator.

Innovation is also measured by the emphasis that is given to a prime (though not the only) input to innovation—research and development. The variables are:

INRD–whether an entrant scored 4 or 5 on the importance given to R&D capabilities.

INIMP–whether an entrant's percent of investment devoted to R&D was above the median of all other entrants.

Finally, the innovative tendencies are measured by the scores that are given to the importance that an entrant attributes to different competitive strategies that involve a broader concept of innovation. The first of these variables complements the other innovation measures by focusing on the frequency of new-product introduction. Since a new product (as opposed to an innovation) can involve product differentiation changes, the coverage of this variable is broader than the variable that captures whether a firm has had a product or process innovation. The first variable used is:

INFREQ–whether an entrant scores 4 or 5 on the extent to which it frequently introduces new or improved products.

The second broader variable captures the extent to which entrants focus on providing a different type of innovation—customization and quality variation. The majority of small firms cannot compete directly on prices with larger firms because of the cost disadvantages associated with size. Instead, they stress a niche strategy by varying the quality of product, offering slightly better levels of customer service, showing flexibility to customer needs or customizing their product for individual customer requirements. The value of a product to consumers is a function of its quality. All firms, but small firms in particular, are constantly experimenting with variations in quality to attract customers. These experiments all involve innovations—though, in most cases,

they are incremental in nature. While incremental, their importance should not be discounted. The cumulative effect of the sum of many changes at the margin can be large. The variable used to catch this aspect of innovation is:

INTRAD–whether an entrant scores at least 18 out of a possible 20 points on the importance attributed to quality, customer service, flexibility in responding to customer needs and customization.

5.2 Technological Competencies

The second advanced competency focuses specifically on whether technological innovation (technovation) in an entrant is important. Technological innovation involves a different though related dimension of innovation—the extent to which an entrant focuses on advanced technology, increases its efficiency of input use, and introduces new production processes. The variables used here are:

INTECH1–whether an entrant scores 4 or 5 on the importance attached to developing new and refining existing technology.

INTECH2–whether an entrant scores 4 or 5 on the importance attached to purchasing technology from others.

TEDEV–whether an entrant both develops/refines new technology and purchases it.

TECOMP–whether an entrant scores 4 or 5 on the importance given to using computer-controlled processes in production.

TEINFO–whether an entrant scores 4 or 5 on using information technology for management purposes.

TEINP–whether an entrant is in the top half of all entrants when it comes to the percent of investment that is devoted to technology acquisition and licensing.

PROD1–whether an entrant scores 4 or 5 on improving efficiency of input use in the production process or reducing production times.

5.3 Comprehensiveness of Innovation in the Entrant Population

The percentage of the population of entrants that are innovative differs considerably depending upon which of the summary measures is used (Figure 9). Judged by the traditional measure (INTRAD), entrants are quite innovative. Many firms are experimenting with the type of innovation that requires bundling service or quality with a good. About 42% of the population place a heavy emphasis on varying quality to provide a unique product to the consumer (INTRAD). Somewhat fewer are introducing new products. Some 32% place more than average importance

on frequently introducing new products (INFREQ). When 'new' is interpreted to mean an 'innovation', fewer firms fall into this category. Some 22% have introduced an innovation over the 1992-94 period (INGEN). Some 14% emphasized an R&D strategy (INRD), but some 29% either report an innovation or that they place above average importance on R&D—about the same percentage that emphasize the frequent introduction of new products.

When the constraint of novelty is imposed on the innovation, the percentage declines by amounts that vary depending on the definition of novelty that is imposed. Only 16% introduced what they consider to be an entirely new product or process (INIMP2). Even fewer (8%) introduced an innovation where intellectual property rights were perceived to be important (INIMP1). Despite these differences, it should be noted that almost all firms are innovative by one or other of these standards: roughly 70% of all firms fall into one of the categories defined here. Innovation is an activity that is widely pursued.

The various measures of the firm's technological capabilities also indicate a diversity of technological competencies (Figure 10). In accord with the finding of Baldwin et al. (1997b) that communications technologies have been expanding fastest, the largest group of firms (47%) emphasize the importance of computer-based information technologies (TEINFO). The next largest percentage of entrants (34%) focus on methods to reduce the cost of inputs and to reduce production times (PROD1). About 25% place heavy emphasis on developing new technologies (INTECH1) or use computer-controlled processes in production (TECOMP). There are about 20% who stress the purchase of new technologies (INTECH2). About 16% of firms both develop new technologies and purchase new technologies from others (TEDEV). Once again, a clear majority of entrants are engaged in some form of technovation; here too approximately 70% fall into at least one of the technovation categories.

These data show that a substantial proportion of new entrants consider themselves to be either innovative or technologically advanced. Moreover, when we consider the characteristics jointly, the percentage of entrants that fall into at least one category increases. For example, some 22% report an innovation, some 14% place a very high importance on R&D and 29% report at least one of these two characteristics. Similarly, 25% of entrants report that they develop new or refine existing technology, while 20% bring in outside technology; but some 30% perform at least one of these two. Some 47% use information technology in management and 25% use computers for process control; however 53% of entrants exhibit at least one of these characteristics. When we expand our definitions of innovation to encompass a characteristic from more than just the innovative group, the percentage of entrants that can be said to be innovative is quite large. Some 39% report an innovation, or perform R&D, or emphasize either the development or purchase of technology. Some 65% do one of the above or emphasize computer controlled processes or stress the use of information technologies.

Figure 10. The Importance of Technology Types

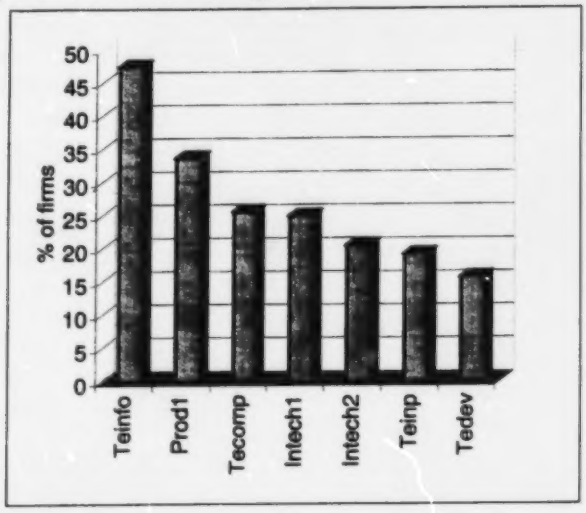


Figure 11. Innovation Scores Ranked by Industry

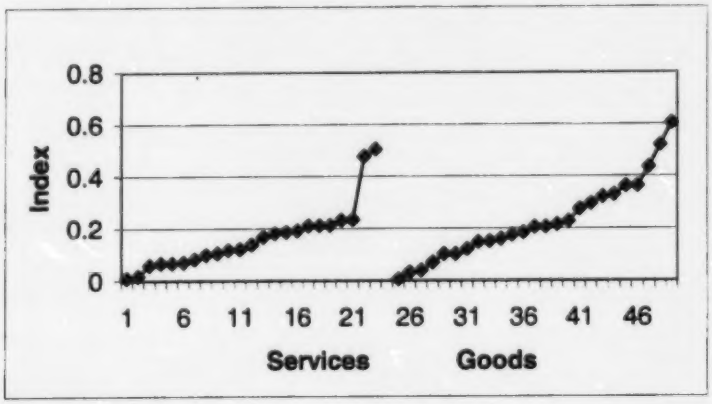
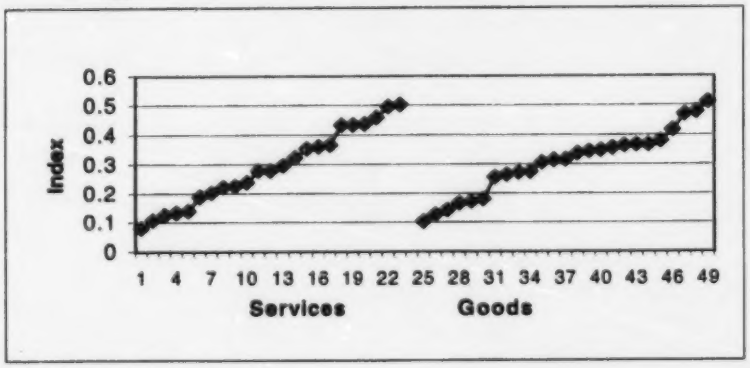


Figure 12. Technology Scores Ranked by Industry



6. *Innovation and Human Capital*

The previous section examines the extent to which different types of innovation are prevalent in new young firms. Innovation, however, is not produced in a vacuum. Skilled workers are key to innovative firms. Research on small and medium-sized firms in Canada has demonstrated that a stress on human capital is an important part of an innovation strategy (Baldwin and Johnson, 1996a). This section asks whether this relationship extends to new firms. It does so by asking whether industries that tend to be more innovative or more technologically advanced than others also tend to place greater stress on skilled workers and to do more training.

6.1 Industry Differences in Innovation, Technology and Firms' Emphases on Skilled Labour

In order to examine how industries differ across the dimensions that our survey measures, the respondents' scores on each of the measured characteristics were averaged for a set of 48 industries in order to produce two indices—one for innovation (INAV), one for technology (TEAV).

Not all firms stress each of the aspects of innovation and technology that are measured here. Some focus on new products. Others develop new processes. But most of the innovation and technology variables are correlated at the industry level[11]. Therefore, they are combined into two separate indices that will be used to rank industries by their degree of innovativeness or technological competencies.

The innovation index is generated in the first instance by taking the average of the variables that are generally regarded as being closely associated with innovation—the existence of an innovation (INGEN, INPROC, INPROD), an important innovation (INIMP1, INIMP2), with the importance of investment in R&D (INIMP), and the importance attributed to R&D (INRD). In addition, the frequency with which new products are introduced (INFREQ) was included in the innovation index.[12] The technology index, in the first instance, consists of INTECH1, INTECH2, TECOMP, TEDEV, TEINFO, and TEINP. The more extensive definition of a cost-cutter (PROD1) was also included.

These indices measure the percentage of firms in an industry that may be said to be innovative or technologically advanced using the definitions outlined above. Industries are ranked by the value of the innovation index from lowest to highest and the values of the index are plotted in Figure 11. In the goods industry the value ranges from a low of 3% to a high of 60%. The same is done for the technology index in Figure 12. Here the goods industries range from around 0 to about 50%.

[11] For a discussion of these correlations, see Baldwin and Gellatly (1999).
[12] Interindustry rankings are not sensitive to the inclusion or exclusion of this more expansive concept of innovation.

Figure 13. Skill Intensity Ranked by Innovation Intensity

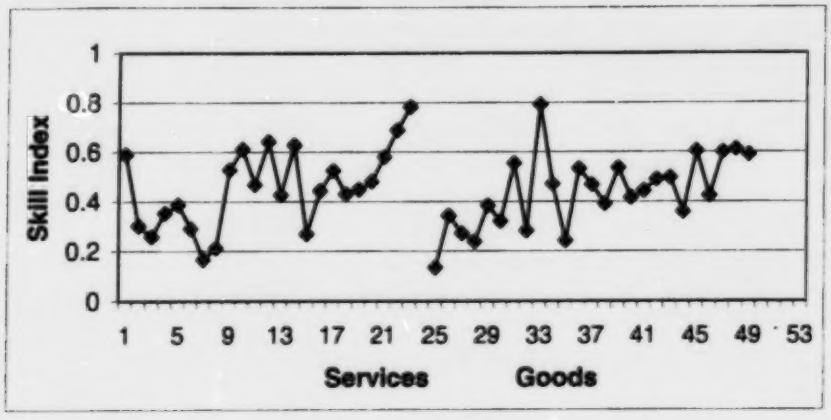
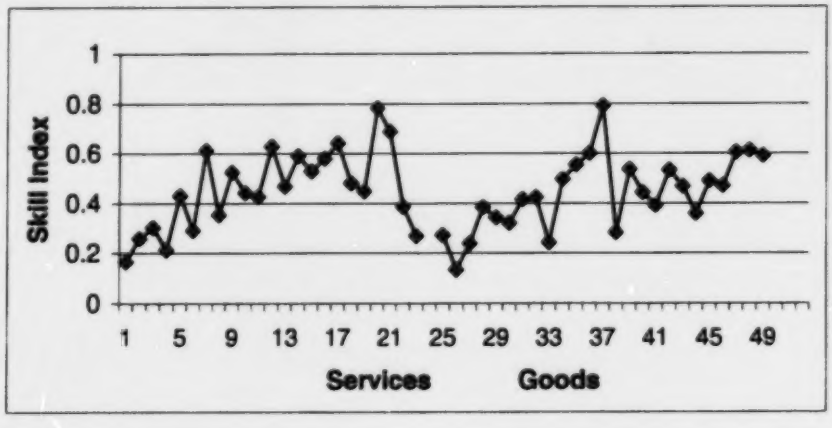


Figure 14. Skill Intensity Ranked by Technology Intensity



Finally, an overall index was created that captured the emphasis that is placed on human capital by new firms. The emphasis on human capital is measured here by the value that an entrant attaches to recruiting skilled labour, on the emphasis it gives to training, and finally on the extent to which it implements a formal training program and invests in training. The variables that are employed are:

LABSKL–whether an entrant scores 4 or 5 on the importance given to recruiting skilled employees.

LABSCOR–whether an entrant scores 4 or 5 on the importance attached to training.

LABFOR–whether an entrant does *formal* training.

LABTRAIN–whether an entrant's share of investment devoted to training is positive.

LABINT–whether the percentage of investment that is devoted to training is above the median for all entrants that have positive levels of investment in training.

The skill-related index (LABAV) consists of the average value of LABFOR, LABINT, LABSCOR, LABSKL, and LABTRAIN. Each industry is ranked by the value of its innovation index (INAV) and then LABAV plotted in Figure 13. The upward slope from left to right of the skill-related index shows that entrants place greater emphasis on training and hiring skilled workers in industries that are more innovative.

When industries are ranked by the technology index (TEAV) and the skill-related index is plotted (Figure 14), the same results are found. New firms in industries that are more innovative or that are more technologically advanced place more emphasis on human capital.

A more detailed examination of the relationship between the industry values of the underlying variables is provided in Table 1, where the skill variables are correlated with the innovation and technology variables. All of the variables have positive correlations. However, it is noteworthy that the stress that is placed by entrants on obtaining skilled workers (LABSKL) always has a lower correlation than the stress that is placed on training (LABSCOR). Innovation is sufficiently firm-specific that entrants have to develop their own human capital skills via training programs. It is also the case that the correlations with the two variables that capture whether a training program is implemented (LABFOR and LABTRAIN) are higher than the variable capturing the importance of labour skills. Training then is the key to both an innovation and a high-tech strategy.

Previous research (Baldwin and Johnson, 1996a) has stressed that the connection between the human resource strategy and the innovation strategy of a firm differs across industrial sectors. In the goods sector, higher skills are associated with accompanying technical emphases. In the services sector, this connection is somewhat more tenuous—because the human capital strategy is the innovation strategy. To investigate the differences in the importance of training in the two sectors, the correlations between the variables measuring the human-resource strategy and the average innovation and technological competency indices are correlated (Table 2). In the goods sector, all of the human capital variables are more closely related to a technology strategy than to the innovation strategy. This is not the case in the service sector, where there is no clear relationship. While entrants in services are more likely to be stressing the importance of skilled labour (LABSKL) where they stress their technological capabilities, they are more likely to be implementing a training program (LABFOR, LABTRAIN) where they stress that they are introducing new products and processes.

Table 1. Correlation between Skill Characteristics and Innovation/Technology Variables

	LABSKL	LABFOR	LABSCOR	LABTRAIN
INGEN	0.27	0.54	0.41	0.52
INIMP1	0.28	0.42	0.43	0.37
INIMP2	0.26	0.46	0.3	0.44
INTRAD	0.34	0.48	0.34	0.48
INPROC	0.3	0.57	0.43	0.5
INCOMP	0.32	0.47	0.45	0.39
INRD	0.39	0.49	0.49	0.4
INIMP	0.24	0.34	0.32	0.19
INFREQ	0.34	0.56	0.45	0.4
INPROD	0.26	0.42	0.38	0.4
INTECH1	0.42	0.46	0.58	0.47
INTECH2	0.29	0.32	0.53	0.29
TEINP	0.18	0.2	0.32	0.3
TEDEV	0.3	0.31	0.48	0.31
TECOMP	0.37	0.19	0.52	0.06
TEINFO	0.48	0.26	0.54	0.2
PROD1	0.28	0.32	0.33	0.18

Table 2. Correlation between Skill Characteristics and Innovation/Technology Variables

	LABSKL	LABFOR	LABSCOR	LABTRAIN
Goods				
TEAV	.54	.52	.72	.58
INAV	.33	.52	.55	.48
Services				
TEAV	.45	.34	.68	.21
INAV	.36	.61	.44	.54

7. *Growth of Entrants and the Importance of Innovation*

7.1 Growth Differences Across All Markets

We have already demonstrated that despite the emphasis that the economics literature has placed on the connection between innovation and firm size, small firms and entrants in particular demonstrate many different types of innovative behaviour. Nevertheless, small firms do face a highly competitive environment as demonstrated above and there are those who argue that competition does not encourage innovation. We investigate this here by asking whether innovation is rewarded by faster growth. In order to investigate the differences between faster and slower growing firms, we separate firms into two groups based on the annual average growth in real revenue from their first full year to 1993.[13]

Faster growing entrants are more innovative in a number of associated ways. They are more likely to introduce new or improved products and to seek out new markets, while at the same time striving for efficiency gains through process innovation.

Accompanying these differences in investment activities associated with innovation and innovation itself comes a considerable difference in the emphasis that is given to technological competencies and R&D capabilities (Figure 16). The largest difference (over 35%) can be found in the extent to which the firm introduces new technologies by purchasing them from others. But differences in R&D capabilities are a close second though they are less statistically significant.

Differences between faster and slower growing firms are somewhat smaller for developing new technologies and protecting products using intellectual property rights.[14]

The greater emphasis on innovative inputs, whether it be R&D or technology, is also accompanied by a greater emphasis on other aspects of the production process that are associated with improving production efficiencies. Faster growing entrants also rate each of the production-related strategies more highly than slower growing entrants, with the largest differential being associated with the use of computer-controlled processes (Figure 17).[15]

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[13] This allows us to be sure that the size for the starting point is a full-year measure rather than a part-year measure of sales.

[14] Only the difference "purchasing others technology" is statistically significant at the 5% level using a one-tailed t-test. R&D capabilities is significant at the 10% level.

[15] Differences for computer controlled processes and high quality suppliers are statistically significant at the 5% level using a one-tailed t-test; the others are statistically significant at the 10% level using a one-tailed t-test.

Figure 15. Differences in the Percentage of Entrants Investing and Innovating Between Faster and Slower Growing Entrants

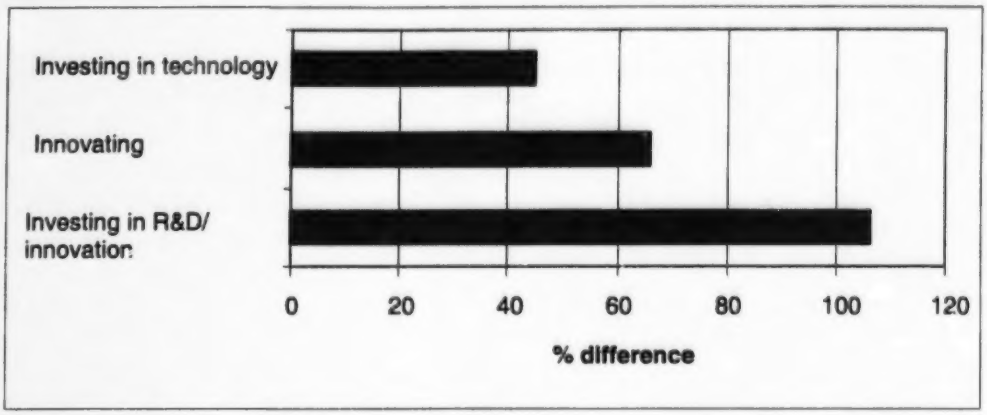


Figure 16. Differences in the Importance of Technological Strategies Between Faster and Slower Growing Entrants

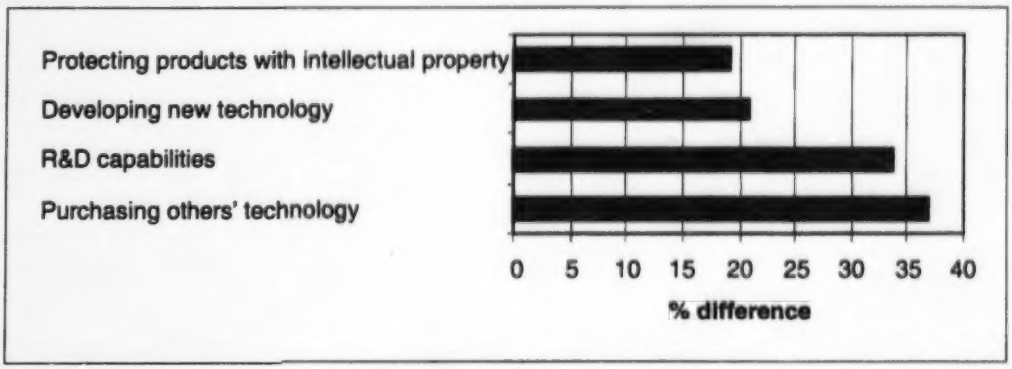
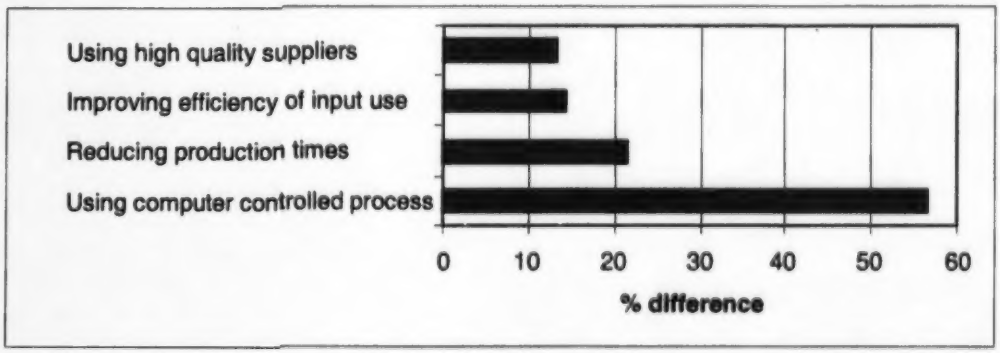


Figure 17. Differences in the Importance of Production Strategies Between Faster and Slower Growing Entrants



The purchase of advanced technologies enhances the physical capital that is critical to innovation. The development of R&D contributes to one type of intangible knowledge capital. The other type of intangible knowledge capital is embedded in the human capital of the firm. Since both of the former receive greater emphasis from faster growing entrants, it is not surprising to find that faster growing entrants also give greater emphasis to each of the strategies associated with creating and maintaining high levels of human capital (Figure 18).

Faster growing entrants give a greater emphasis to incentive compensation plans. Plans such as these provide the incentive to be inventive where risk and rewards need to be shared if innovative projects are to be brought to market. But faster growing entrants also place more emphasis on recruiting skilled employees and on training.[16]

Faster growing entrants rate almost all of the product-specific strategies higher than slower growing entrants. They are most distinguished from slower growing firms in the value they place on product innovation-related strategies such as customizing their products, frequently introducing new/improved products, and offering a wide range of products (Figure 19).

Innovative strategies in faster growing firms do not replace the attention that these firms give to enhancing existing products. Growing entrants also place more value on flexibility in responding to customer needs, customer service, and quality; moreover, the former two differences are statistically significant. Growing entrants do not maintain unchanged product lines; rather they focus on introducing new products that are of a higher quality and on improving the delivery of the product.[17]

The innovative stance of growing entrants is evident in their marketing strategy as well. Growing entrants place significantly greater emphasis on expanding their market reach (Figure 20). The greatest differential occurs in the emphasis that is placed on using third-party distributors. The next most important differentials exist in the emphasis that is placed on targeting new foreign markets and improving their position in existing markets.[18]

[16] All these differences are statistically significant at the 5% level using a one-tailed t-test.

[17] Except for customer service and range of products, all the positive differences are statistically significant at the 5% level for a one-tailed t-test. The former are significant at the 10% level

[18] Promoting reputation, improving position in existing markets, and using third-party distributors are statistically significant at the 2.5% level; the other differences are statistically significant at the 10% level using a one-tailed t-test.

Figure 18. Differences in the Importance of Human Resource Strategies Between Faster and Slower Growing Entrants

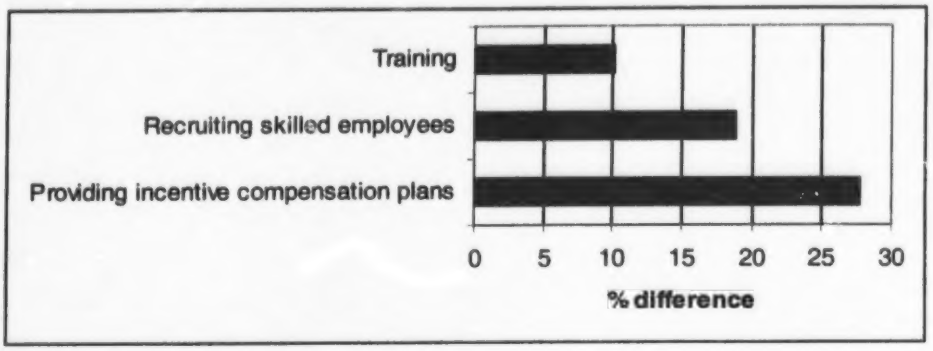


Figure 19. Differences in the Importance of Competitive Strategies Between Faster and Slower Growing Entrants

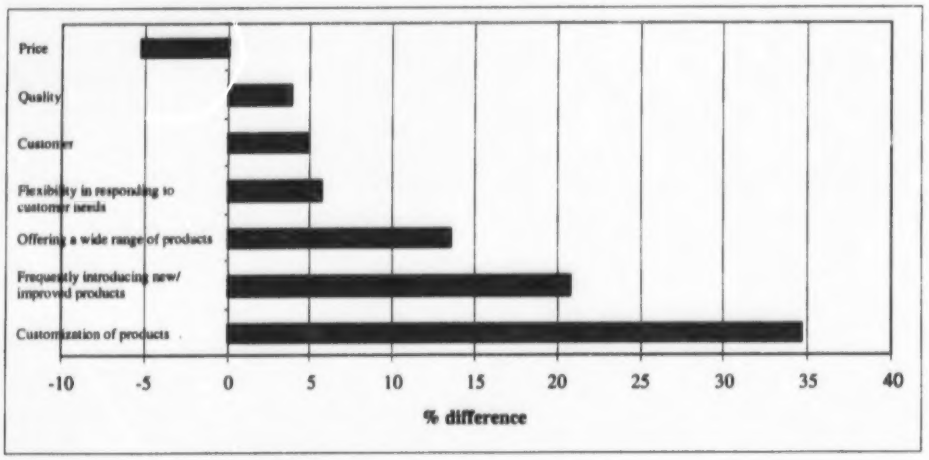
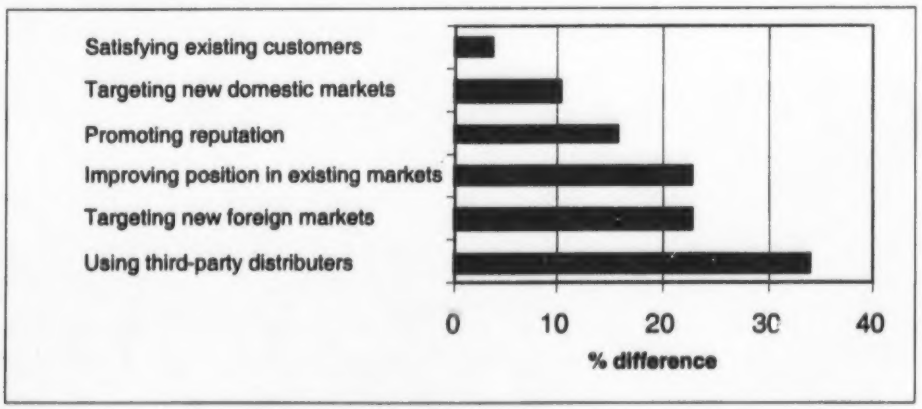


Figure 20. Differences in the Importance of Marketing Strategies Between Faster and Slower Growing Entrants



7.2 Growth Differences in New and Mature Markets

Examining differences between faster and slower growing firms for the entire population of entrants establishes which competencies are associated with growth, irrespective of the specific environmental factors affecting the entrants. Yet, there is reason to believe that the importance of these factors may vary across industries. In particular, the stage of the industry is likely to affect the type of innovative activity and the complementary strategies that are adopted by faster growing entrants.

In new product markets that are in their early growth phase, the characteristics of the product are continually changing. In these volatile markets, the entrants that grow should be those that keep pace with or lead product changes. Entrants that grow in these markets are those that anticipate and stimulate demand for new product features, and focus on product development. At this stage of development, product change is so rapid that firms have little time to focus on process innovation, and there is relatively less to gain by focusing on improving the efficiency with which existing products are produced. The emphasis that firms give to improving the way existing products are produced, or to extending their market reach, is likely to become more important as markets mature.

In order to examine the extent to which there are differences in the innovation profile of entrants and differences in the types of competencies that are associated with growth, entrants are separated into two groups—those in markets that are in their introductory or growth stage (new markets) and those in markets that are in their mature or post-mature stage (mature markets). Differences in the competencies of faster and slower growers are then examined in order to determine the extent to which the stage of the market changes the conclusions previously derived as to the nature of competencies associated with growth.

When this is done, innovation is still found to be strongly associated with growth, regardless of the market's maturity. Innovation is more prevalent in faster growing firms than in slower growing firms in both new and mature markets (Figure 21). In new markets, an emphasis on product innovation serves to distinguish faster from slower growers; this is not the case for process innovation. In mature markets, faster growers are more likely to be doing more of both process and product innovation. Our hypotheses about the differences in the importance of innovation across the product lifecycle are only partially confirmed. It is true that process innovation matters more in mature markets than it does in new markets. But product innovation is equally important in terms of growth in both markets.

In keeping with the importance of human capital to the growth process, growing firms are more likely to train in both new and mature markets (Figure 21). We know that innovation brings about greater skill requirements (Baldwin and Johnson, 1996a), and firms that innovate tend to train more. Consequently, it is not surprising to find that faster growing firms, in each of the groups, are more likely to train than are slower growing firms.

Figure 21. Differences in Innovative Activities Between Faster and Slower Growing Firms

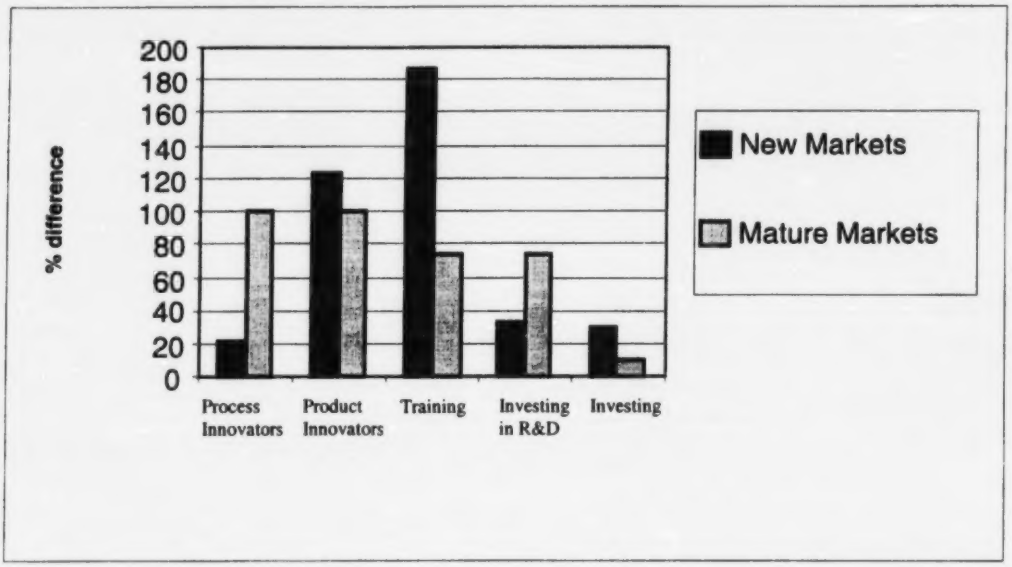
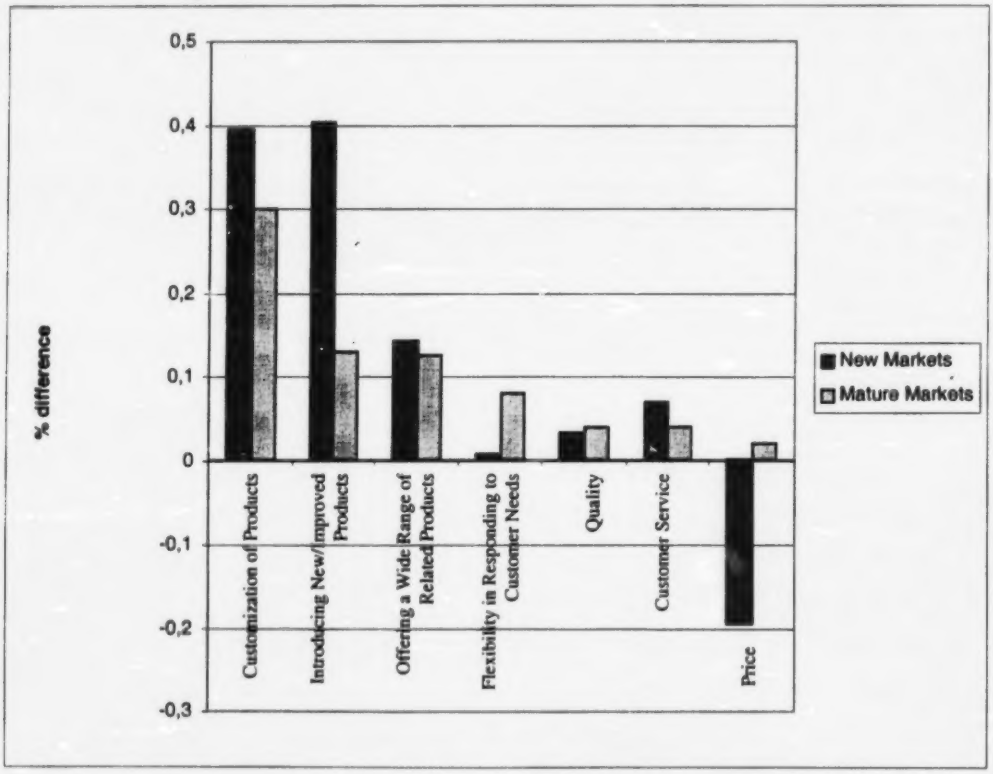


Figure 22. Differences in the Perceived Importance of Customer Strategies Between Faster and Slower Growing Entrants



However, it is noteworthy that the training differences between faster and slower growing firms are greater in new than in mature markets. Mature markets are more likely to require skills that can be obtained by hiring workers with existing skill sets. In new markets, new products are being introduced so rapidly that new skills are constantly required. The very novelty of the products often requires skills that are so new or firm-specific that companies have to train workers to match the desired skill level. Therefore, training becomes more critical to the growth process in markets where the product is in the earlier stages of the product lifecycle.

R&D also serves to distinguish faster from slower-growing firms in both stages of product development (Figure 21). However, the difference is greater for mature markets. At first glance, this is counterintuitive since R&D is associated with new product development, which in turn is linked with new markets. But, as we have seen, product development is equally important in both market stages, while process innovation is more important in mature markets. If R&D is a critical component required for both types of innovation, then R&D differences should be greater for mature markets—as they are.

While the connection between growth and the intensity of product innovation does not serve to distinguish new from mature markets, other aspects of the customer product strategy do so (Figure 22). There are positive differences between faster and slower growing firms with regards to both customization of new products and the frequency of introducing new/improved products for both mature and new markets. This is what one would expect since the emphasis on product innovation is greater for faster growing than for slower growing firms in both markets. However, the difference between faster and slower growing firms is greater in new markets where products are changing more rapidly. By way of contrast, differences in mature markets are greater for the strategy of responding to customer needs in a flexible manner. There are smaller differences between faster and slower growing firms for the two conventional aspects of competition—quality and customer service—but the differences are nonetheless positive. The difference is statistically significant in new markets for a quality strategy; in mature markets, it is significant for a customer-service strategy.

Associated with a greater stress by growing firms on product innovation and other new product strategies comes a greater emphasis on a number of different marketing strategies (Figure 23). Faster growing firms in both markets are significantly more likely to stress product reputation. They are both more likely to stress market expansion—but the source of that expansion differs because the markets are not at the same point in the lifecycle. Faster growing firms in mature markets are more likely to target new foreign markets and new domestic markets than are faster growing firms in new markets (Figure 23). Despite the fact that mature markets offer less growth on average, faster growing firms in the mature stage of a product lifecycle expand by targeting both new domestic and foreign markets.

Figure 23. Differences in the Perceived Importance of Marketing Strategies Between Faster and Slower Growing Entrants

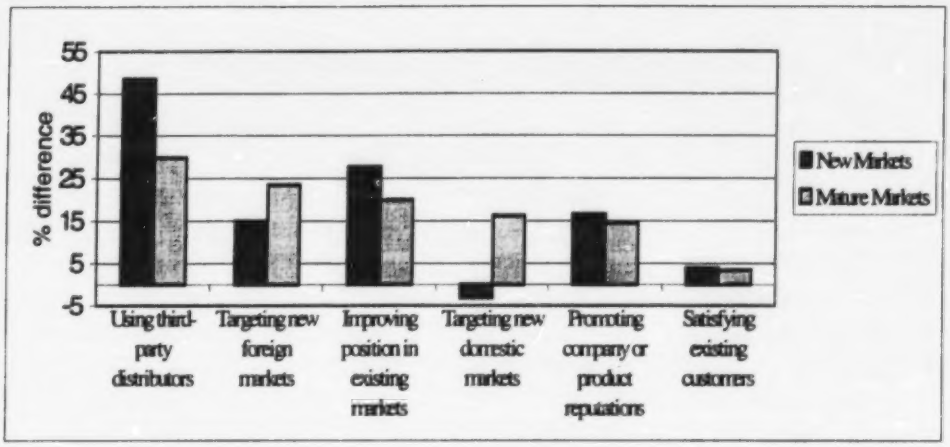
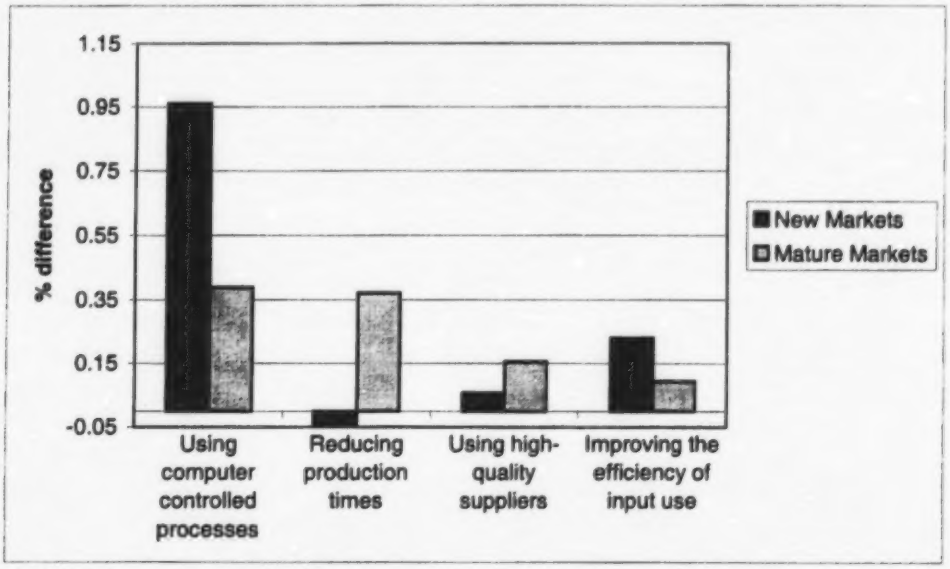


Figure 24. Differences in the Perceived Importance of Production Strategies Between Faster and Slower Growing Entrants



All firms in the initial stage of the product lifecycle are producing new products for new markets. Therefore, it is not surprising that the stress on new markets does not distinguish between faster and slower growers here. However, it is true that the percentage difference in the stress that is placed on improving existing market position, which for firms in new markets means expanding market share in their new product markets, is greater between faster and slower growers in new markets than in mature markets. Therefore, growing firms in this phase of the product lifecycle do place a greater emphasis on the aspect of market expansion that was relevant to them.

More importantly, what serves to distinguish faster growers from slower growers in new markets is the extent to which third-party distributors are used. The demands being made on new firms in the early stages of the lifecycle are sufficiently large that relying on outside parties for distribution, where they are available, husbands scarce resources.

This section demonstrates the universal importance of product innovation in markets that differ in terms of their position in their lifecycle. While differences in emphasis exist, they involve detail only—with more new products and more customization in the early stages of the lifecycle. The degree of process innovation shows more market differences. Mature markets are those where growth is more closely related to process innovation.

This finding should not be interpreted to mean that an emphasis on production strategies is unimportant in new markets. While faster growing firms in new markets place relatively less stress on process innovations (Figure 24), they are more likely to stress new computer-based production strategies. On the other hand, faster growers in mature markets are more likely to focus on reducing production times or using high-quality suppliers.

In summary, similarities in the importance of product innovation can be found across markets that are both young and old. The generalizations that originated in comparing faster and slower growing firms in the entire population are qualified but are not overturned when the analysis is extended to markets that differ by degree of maturity. Adding detail by examining different markets provides insights that bolster the original conclusion that innovation is critical for growth. In particular, product innovation is important in both young and old product markets alike.

Successful entrants are those that reach beyond the bounds of their established product markets. They introduce new and/or improved products and seek out new customers. They look inside the firm. They give greater emphasis to training. They continually strive to improve, update and modify their operations—but in different ways. Despite the primary focus of entrants on established markets that has been drawn in a previous section, innovation in new firms in most markets is rewarded with growth. These results corroborate those found in the GSME survey (Baldwin et al., 1994) where more successful[19] firms outperform less-successful firms in almost every area, but where innovation is the key factor that discriminates between more- and less-successful firms.

[19] In the 1994 study, success is defined by an index consisting of growth in market share, productivity and profitability.

8. *The Joint Effect of Innovation, Technological and Skill Competencies on Growth*

Innovation has different dimensions. Previous sections have examined the extent to which each of these dimensions is pursued by new firms and how some of these dimensions, such as training and technology use, are related. However, the connection between an entrant's emphasis on skills and innovation was conducted primarily at a high level of aggregation. The various dimensions of innovativeness or technological competence were combined into one index and compared to the dimensions of a skill-based human resource strategy, either separately or together.

In order to pursue the distinctions that might exist across types of innovators in terms of their emphasis on training, the emphasis that is given to skill development in four different groups is investigated here. Entrants are divided into those that produced just a product innovation, just a process innovation, both product and process innovations, and those that did not report an innovation.

There are two reasons for choosing this classification scheme for analyzing differences in human-resource strategies. First, a cluster analysis of all the innovation and technology characteristics in entrants that were described earlier produced these four distinct clusters. Secondly, Baldwin and Johnson (1998) used an associated survey on small and medium-sized firms and found that these four types differ substantially in terms of their success and strategic emphasizes. Confirming that these differences can also be found in the entrant population corroborates the differences that were previously observed.

In order to assess the success of each category, the survey respondents were divided into two groups—the faster and the slower growers.[20] Then the proportion of each innovator group that fell in the highest growth category was calculated. The combined product/process innovators are most likely to be in the highest growth category. Some 70% of this group fall in the faster growing group (Figure 25). Product innovators are second (59%) and process innovators are third (49%). Less than 43% of noninnovators are found in the top half of growers.

These differences accord with previous research that also found the highest growth rates belonged to comprehensive innovators and the lowest to non-innovators (Baldwin and Johnson, 1998). This suggests that comprehensive innovation is the key to success, or that this type of innovator is located in the fastest stage of the lifecycle of a product market. That product innovators grow slightly more quickly than process innovators could also be connected to differences in the position of each innovator type in the product lifecycle. If process innovators are more likely to be in the later mature phase of the product cycle, their lower growth rates simple reflect the more mature stages of the market. The results of the previous section that show a larger percentage of firms in mature markets to be process innovators suggest that this explanation accounts for part of the difference. The innovative group with the highest growth rates also places the greatest stress on training.

[20] The sorting was done separately for each birth year in the sample.

The average score on each of the human resource strategy variables is highest for the combined product/process innovators and generally lowest for the noninnovators (Figure 25). This too accords with the previous findings (Baldwin and Johnson, 1998). Comprehensive innovators tend to emphasize a number of strategic areas more intensely than do noninnovators (Baldwin and Johnson, 1996b) and human resource strategies is one of these areas. For three of the four variables, product innovators place greater stress on the importance of the strategy than do process innovators. In the previous study, differences between these two groups were not found to be large. Our results here suggest that product innovators may indeed need to worry more about training because the skills required of the workforce at the early growth stage have to be developed internally rather than acquired externally.

In the previous two sections, growth was shown to be associated with a number of separate strategies. Faster growing entrants were more likely to be innovative and more likely to pursue a human resource strategy that focused on recruiting skilled employees, training them and retaining them. The connection between these different strategies was not investigated at great length. Was it innovation itself that led to growth or skill emphasis? Or was the difference in skill emphasis and its relation to growth simply caused by the fact that innovators generally are in the faster growth class and innovation requires a special type of human-resource strategy?

We investigate this issue in two ways. In the first instance, we divide each of our innovative types into those that emphasize a particular human-resource strategy—for example, into those that have or do not have a formal training program (LABFOR). This is also done for LABTRAIN, LABSKL, and LABSCORE. Then we calculate the percentage of those firms emphasizing the skill strategy that are fast growers and those that are slow growers within an innovation class. These percentages are plotted for each innovator type in Figure 26 for the two variables that capture whether a training program is in place (LABFOR, LABTRAIN). In each case, there are a higher percentage of fast growers in the category where training is being done. These differences do not exist for the two variables that just rank the importance of training (LABSCORE) or the importance of recruiting skilled labour (LABSKL) except for the noninnovator category. In conclusion, irrespective of the category, if training plans are implemented, growth is superior. Training is an important complementary strategy for innovators but training matters, irrespective of the innovation environment.

The second approach to test the separate effect of training on success involved the use of multivariate analysis. The rate of growth of the successful entrants was regressed on the three indices—INAV, TEAV, and LABAV. This regression was run separately by three groups that were used for stratification purposes in the original sample. This was done first for the entire sample. Second, it was done for goods versus service industries. Third, it was done for high knowledge and low knowledge industries. High and low knowledge industries were defined using R&D/sales ratios, average wage and multifactor productivity growth.[21]

[21] See Baldwin (1998) for a discussion of the creation of this industry taxonomy.

Figure 25. Differences in Growth and Skill Emphasis Across Innovator Types

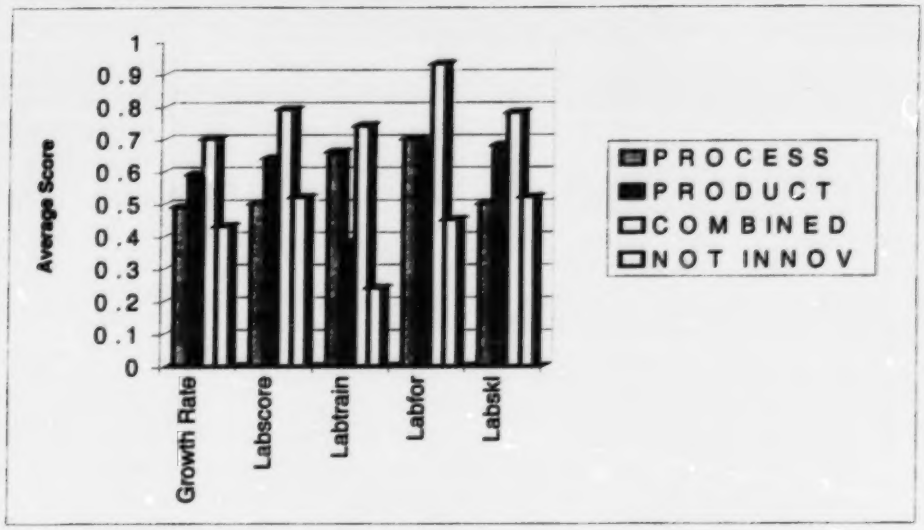
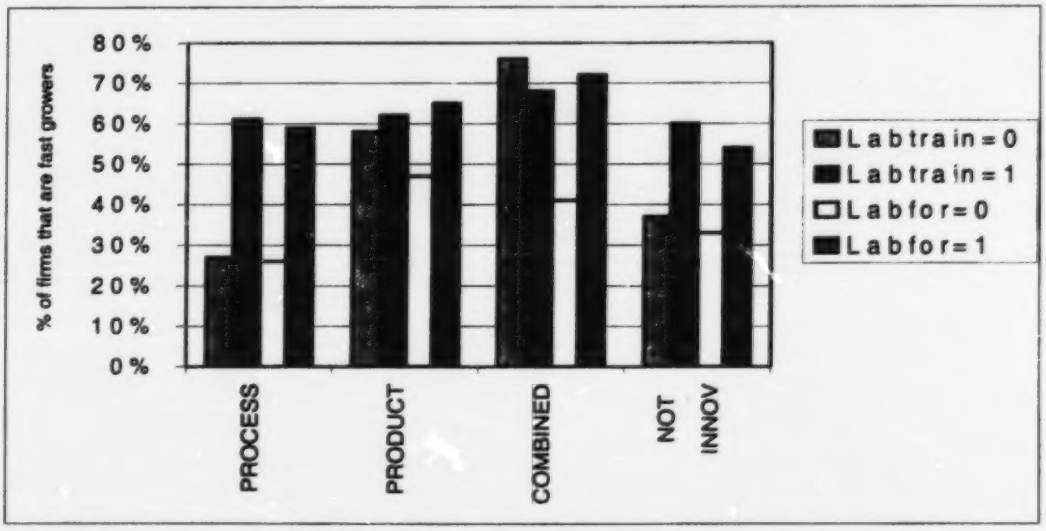


Figure 26. Differences in the Percentage of Firms that are Fast-Growers by Skill Group



For the entire sample, the results show that innovation and labour skills are each significantly related to the growth of entrants. The skills variable has about the same coefficient as the innovation variable. When the sample is broken down into goods and services industries, the innovation variable has a larger and more significant coefficient in goods than services. Moreover, the innovation variable is significant in the former but not the latter. The reverse is true of the skills variable. This confirms earlier results (Baldwin and Johnson, 1996a) that stress the human-resource emphasis in services is a key factor behind growth. When the sample is broken into 'high' and 'low' knowledge industries, innovation is seen to be more important in the former, while labour skills are equally important in both. In conclusion, the effect of an emphasis on skills is generally felt independently of the effect of innovation on growth, and this is pervasive across the subsectors examined here.

Table 3. Coefficients from a regression of growth on innovation, labour and technology indices

	Innovation (INAV)	Skills (LABAV)	Technology (TEAV)	
All	.072	.077	-.011	F(3,2794)=9.0
	(.031)	(.030)	(.029)	
	[.021]	[.009]	[.707]	
Goods	.156	.066	-.009	F(3,2794)=10.7
	(.065)	(.069)	(.053)	
	[.016]	[.344]4	[.858]	
Services	.043	.087	-.015	F(3,2794)=6.3
	(.032)	(.031)	(.035)	
	[.176]	[.005]	[.664]	
High Knowledge	.084	.070	.041	F(3,2794)=8.0
	(.032)	(.035)	(.45)	
	[.009]	[.045]	[.369]	
Low Knowledge	.068	.077	-.045	F(3,2794)=3.7
	(.045)	(.043)	(.038)	
	[.134]	[.082]	[.247]	

Note: Bracket figures are probability values for a two-tailed t test for the null hypothesis that the coefficient is zero.

9. Conclusion

Entry is important. At any point in time, a substantial amount of market share or employment is accounted for firms that entered in the recent past.

Entry is an inherent part of the dynamic competitive process that leads some firms to grow and others to decline. And it is within this context that it needs to be appreciated. It is not the only process at work—but it is an important part of it.

The entry process involves trial and error. Firms have to develop basic skills before they can survive—and large numbers appear not to have these skills at birth. Firms that fall by the wayside generally start off smaller, pay lower wages and have lower labour productivity. Moreover, their management lacks knowledge of basic management skills in many cases (Baldwin et al., 1997). Nevertheless, there is a subset of new entrants that survive and grow—and the growth of this group is substantial.

It is in the area of innovation that entrants make a widespread contribution. The contribution of entrants to some industries is well understood. New technology-based firms play an important role in the early stages of the lifecycle of many industries. They are the means by which the ideas of new entrepreneurs are initially commercialized. Whether it be in electronics, instruments, medical equipment, steel, or biotechnology, new firms have played an important role in the innovation process.

While the profile of entrants in industries such as electronics and biotechnology is highly visible, the role of small firms is important in many other industries. Innovation is widespread and is generally associated with growth. Firms in many industries have developed the capacities that are needed for innovation in their particular industries. These capabilities often involve development of new technology or devising new products or processes that are highly novel. The range and diversity of the innovation skills of new firms across all industries is remarkable.

The importance of the innovation process is attested to by the connection between growth and innovation. The successful entrants that grow the most are those that develop one or other type of innovative activity—either with respect to the introduction of new products, an emphasis on technology, or human resources.

This innovation process, to be successful, requires complementary skills. In particular, firms that develop new products and processes have to focus more intensely on human resource capabilities. Key among these capabilities is the training activities of entrants. New firms develop competencies in a number of different areas. An innovative firm may focus more intensely on a broad range of competencies, but training is a key complementary capability. More importantly, while training complements the innovation strategy, it has an effect on growth that is quite separate from the innovation/technology strategy that a firm pursues. Entrants that train are more likely to grow—irrespective of the emphasis that a firm places elsewhere on innovation and technological capabilities.

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